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Complete Specification entitled (54) IMPROVEMENTS IN AND RELATING TO PROFILE SHAPING APPARATUS

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Applicant (71) MOTORWAYS (N. Z.) LIMITED

Actual Inventor (72) JAMES WILLIAM McLEAN, and WALTER DUDLEY

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The following statement is a full description of this invention, including the best method of performing it known to us:

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This invention relates to profile shaping apparatus and is more particularly concerned with apparatus for buffing and trimming the outer peripheries or tread portions of vehicle tyres prior to the recapping or retreading or remoulding of such tyres, although it will be appreciated that the invention may have other applications in the profile shaping of articles other than tyres.

An object of this invention is to provide apparatus for profile shaping articles such as vehicle tyres and which is both simple and safe to operate by a single operator, is capable of performing the profile shaping operation rapidly and efficient and includes means for moving the article to be profiled relative to cutter means by the employment of a profile determining template and template follower mechanism having an arrangement such that the cam follower does not engage with undue pressure on the template in a manner likely to cause excessive wear of the template as may take place on known profile shaping apparatus. Other objects and advantages of the present invention will become apparent from the ensuing description.

According to this invention therefore there is provided profile shaping apparatus comprising a fixed support having first and second track means with the second track means extending away from one end of the first track means, a first carriage mounting cutter means and being movable along the first track means to and from the second track means by first hydraulic ram mechanism, a second carriage capable of mounting an article to be shaped and being movable along the second track means to and from the first track means by second hydraulic ram mechanism, the cutter means and article being located in positions such that the article can be moved onto the cutter means and the cutter means can traverse

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across the article and engage and cut the peripheral parts thereof; and there being hydraulic switching valve means and a template follower mounted so as to be movable along the second track means to and from the first track means with the second carriage and by means of second hydraulic ram mechanism, the switching valve means being coupled to the second hydraulic ram mechanism and the template follower being arranged to engage and follow a template mounted on the first carriage and to actuate the switching valve means in controlling movement of the article relative to the cutter means.

As previously indicated, the present invention is particularly applicable to tyre buffing machines which buff and trim the tread portions of tyres prior to the retreading or recapping or remoulding of such tyres and thus preferred forms of the invention will now be described by way of example with reference to such an application and the accompanying drawings, in which:-

Figure 1 is a diagrammatic plan view illustrating one arrangement of apparatus in accordance with the invention,

Figure 2 is a view in the direction of arrows II-II in Figure 1,

Figure 3 is a view in the direction of arrows III-III in Figure 1, and

Figure 4 is a view in the direction of arrows IV-IV in Figure 1.

The support or base of the apparatus may be generally L shaped when viewed in plan with one leg 1 of the L shape constituting the rear part of the apparatus and the other leg 2 of the L shape extending forwardly therefrom to the forward end of the

apparatus, at which point a control panel 3 may be provided for the actuation and control of the operative parts of the apparatus.

The first track means extends along the length of the rear part of the support and may include upper and lower parallel tracks, 4 and 5 respectively, along which the first carriage 6 may slide or run, traversing movement of the first carriage 6 to and fro along the length of the first tracks 4 and 5 being effected by a double acting hydraulic ram unit 7 mounted parallel with the first tracks, 4 and 5, and having the outer end or ends of the ram 7a fixedly mounted on the support rear part 1 and the body part 7b (which is slidable lengthwise over the ram 7a) secured to the first carriage 6; the control means being such that the first carriage 6 may be moved in either direction along the length of the first tracks 4 and 5, at the will of an operator or may be set for automatic to and fro traversing.

The first carriage 6 mounts the cutter means and preferably such cutter means is in the form of a rotary rasp or like cutter 8 which may be driven such as by an electric motor 9 mounted on the first carriage 6, the rotary cutter or rasp 8 being rotatable in a horizontal plane about a vertical axis. As with known tyre buffing machines, the rotary rasp 8 may be partly enclosed by a housing 10 having an opening 10a to the front and fan 10b or other extraction means may be coupled to such housing 10 for the removal of at least a major part of the material cuttings made by the rasp 8 in operation.

The forwardly extending part 2 of the support may be similarly provided longitudinally with upper and lower tracks, 11 and 12 respectively, along which the second carriage 13 may slide or run; and such second carriage 13 mounts a transverse spindle 14 which extends inwardly of the apparatus and parallel with the first

tracks, 4 and 5, and is provided towards its end with a tyre carrier 15 on which a tyre 16 to be buffed may be mounted so as to be alignable with the rasp 8 when at its mid traverse point. Thus when the rasp 8 is traversing to and fro on its carriage 6 it may engage and cut the peripheral tread parts of the tyre 16. The spindle 14 supporting the tyre carrier 15 and tyre 16 is arranged to be rotated and may be driven such as by an electric motor 17 (preferably a variable speed motor) or like prime mover mounted on the second carriage 13 and through suitable gearing and power transmission means.

It is envisaged that the switching valve means and template follower can be mounted on or directly connected to the second carriage, but (and as illustrated) preferably a third carriage 18 is mounted to the rearward side of and coupled to the second carriage 13 for to and fro movement with the second carriage 13 along the second tracks 11 and 12.

Movement of the second and third carriages, 13 and 18 respectively, to and from the rear of the apparatus is arranged to be effected by a second double acting hydraulic ram unit 19 which is secured to the support and the third carriage 18, the ram 19a of the unit 19 being fixedly mounted longitudinally of the support forwardly extending part 2 and the body part 19b (which is slidable lengthwise over the ram 19a) being secured to the third carriage 18; the control arrangement for the second hydraulic ram unit 19 is such that the second and third carriages, 13 and 18 respectively, can be moved rearwardly or forwardly together along the second tracks 11 and 12 at the will of an operator and may be arranged for automatic rearward and forward movement in the tyre buffing operation as herein described.

The third carriage 18 mounts a two-way hydraulic valve

switching mechanism 20 which is coupled to the second hydraulic unit 19 and the source of hydraulic power supply so that operation of such switching mechanism 20 may effect operation of the second hydraulic ram unit 19 in causing the second and third carriage 13 and 18, to move together to or from along the second tracks and 12.

The third carriage 18 also mounts a template follower 21 which is arranged to engage and move over a template 22 mounted and movable with the first carriage 6, and is also coupled to and/or co-operable with a switching arm or shaft 23, of the hydraulic switching valve mechanism 20 so that movement of the template follower 21 will effect operation of the switching mechanism 20 to cause movement of the second carriage 13 and thus movement of the tyre 16 in relation to the rasp 8. The template 22 may be flat and is arranged for mounting in a horizontal plane on a support arm 24 extending from the first carriage 6 parallel with and above the first upper track 4 and across the rear end of the second upper track 11 so that the forward operative edge 22a of the template 22, which is shaped to determine the required finished profile of the tyre 16, is capable of traversing to and fro across the rear end of the second upper track 11 in the path of the template follower 21.

The template follower 21 is preferably in the form of a wheel or roller which is rotatable about a vertical axis on a stabilizing arm 25 which is pivotally movable in a horizontal plane and has its end part remote from its pivotal connection coupled to or bearing against the rear end of the switching arm or shaft 23, which is arranged generally parallel with and above the second upper track 11 and extends through the body of the switching mechanism 20. The switching arm or shaft 23, and th-

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the template follower 21 coupled directly or indirectly thereto, is preferably spring biased towards the template 22 and in one arrangement the switching arm or shaft 23 may also extend beyond the front end of the body of the switching mechanism 20 and may be arranged to act against a compression spring 26 provided at such forward end; the spring biasing being arranged to normally cause the valve switching mechanism 20 to actuate the second hydraulic ram unit 19 so as to maintain the template follower 21 in gentle but positive contact with the forward operative edge 22a of the template 22.

The third carriage 18 with the hydraulic switching mechanism 20 and template follower 21 mounted thereon is also preferably movable along the second tracks, 11 and 12, towards and away from the second carriage 13, or vice versa, at the will of an operator by a third double acting hydraulic ram unit 27 forming the coupling between the second and third carriages, 13 and 18; the unit 27 having one end of the ram body 27a secured to the second carriage 13 and having the other end of ram 27b coupled to the third carriage 18 so that the position of the second carriage 13 relative to the third carriage 18 can be adjusted at will by an operator, according to the diameter of tyre 16 to be treated, and then maintained in such desired position whilst the second and third carriages are moved together in carrying out a tyre buffing operation.

In operation a tyre 16 to be shaped is fitted to the tyre carrier 15 and inflated to the required pressure, inflation may be effected through the carrier 15 itself, and the second carriage 13 is moved into the appropriate position relative to the third carriage 18 and into the operative position where the tyre 16 can be engaged and cut by the rasp 8 when the rasp 8 commences its

traversing along the first track means (tracks 4 and 5), the first carriage 6 and rasp 8 being located towards one end or at the middle of its normal traversing path and the third carriage 13 being in position with the template follower 21 engaging or about to engage on one end of the forward operative edge 22a of the template 22. With the tyre 16 rotated and the rasp 8 operating, setting the carriages 6, 13 and 18, for manual control or automatic traversing in their prescribed paths will permit the first carriage 6 and thus the template 22 to move to and fro causing the template follower 21 to over ride the template surface or operative edge 22a thereby operating the switching mechanism 20 and causing the second carriage 13 to move in and cut according to the shape of the template 22 and simultaneous with the traversing of the rasp 8 across the peripheral tread portions of the tyre 16 in ensuring correct and speedy shaping of such tyre 16. The depth of tread to be cut can be set by a suitable adjusting mechanism (not shown) on or associated with the second carriage 13 or, and in a preferred and simplest form of the invention, the operator can control the forward movement of the second carriage 13 relative to the third carriage 18 and position the tyre 16 as desired relative to the rasp 8 prior to the full path of the template 22 being followed by the template follower 21.

The arrangement provides that the pressure of the template follower 21 on the template 22 is relatively slight and thus there is, in operation, a minimum of wear on such template 22. Such arrangement therefore permits the employment of templates made of timber or other stiff material which is readily available and easily worked when compared with the normally provided robust metal templates. Thus special templates for any particular

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desired profile of tyre may be easily and quickly manufactured at relatively little cost when compared with the cost of preformed metal templates or guides. Further, as there is little pressure on the template in the present invention, such templates do not require the normally provided strong securing devices and the templates employed by this invention may be arranged for quick detachable fittings.

One form of the invention has been particularly described with reference to tyre buffing but it will be appreciated that the invention may have other applications and that other variations of and modifications to the invention may take place without departing from the scope of the appended claims. The source of hydraulic power supply for the apparatus may be provided on the apparatus in the form of a hydraulic pump driven by an electric motor, or the hydraulic power supply may come from an outside source; further, whilst the employment of hydraulic power and hydraulically operable ram units has been described as this is believed to be the best method of performing and carrying out the invention, it is envisaged that pneumatic or vacuum power and appropriate ram units may be alternatively employed although the resultant actions may not be as positive and stable as when hydraulic power and appropriate ram units are utilised.

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. Profile shaping apparatus comprising a fixed support having first and second track means with the second track means extending away from one end of the first track means, a first carriage mounting cutter means and being movable along the first track means to and from the second track means by first hydraulic ram mechanism, a second carriage capable of mounting an article to be shaped and being movable along the second track means to and from the first track means, the cutter means and article being located in positions such that the article can be moved onto the cutter means and the cutter means can traverse across the article and engage and cut the peripheral parts thereof; and there being hydraulic switching valve means and a template follower mounted so as to be movable along the second track means to and from the first track means with the second carriage and by means of second hydraulic ram mechanism, the switching valve means being coupled to the second hydraulic ram mechanism and the template follower being arranged to engage and follow a template mounted on the first carriage and to actuate the switching valve means in controlling movement of the article relative to the cutter means.
2. Apparatus as claimed in claim 1 wherein the support is generally L shaped when viewed in plan with one leg of the L shape constituting the rear part of the apparatus and the other leg of the L shape extending forwardly therefrom to the forward end of the apparatus, the first track means extending along the length of the rear-part of the support and the second track means extending along the length of the forwardly extending part of the support.
3. Apparatus as claimed in claim 2 wherein traversing move

of the first carriage to and fro along the length of the first track means is effected by a double acting hydraulic ram unit mounted parallel with the first track means and having a ram of the unit fixedly mounted at its ends on the support rear part, and the body part of the unit (which is slidable lengthwise over the ram) secured to the first carriage.

4. Apparatus as claimed in claim 2 or claim 3 wherein the cutter means mounted on the first carriage comprises a rotary rasp or like cutter which is arranged to be driven by a motor mounted on the first carriage, the rotary cutter or rasp being rotatable in a horizontal plane about a vertical axis.

5. Apparatus as claimed in claim 4 wherein the second carriage on the second track means is provided with a transverse spindle which extends inwardly of the apparatus and parallel with the first track means, and such spindle is provided towards its inner free end with a tyre carrier on which a tyre equiring to be trimmed or buffed prior to retreading may be mounted so as to be alignable with the rasp when at its mid traverse point, the arrangement providing that when the rasp is traversing to and fro on its carriage it may engage and cut the peripheral tread parts of the tyre, the spindle supporting the tyre carrier and tyre being rotatable and driven by a motor mounted on the second carriage and through suitable gearing and power transmission means.

Apparatus as claimed in claim 3, claim 4 or claim 5, wherein the switching valve means and template follower are mounted on a third carriage which is disposed to the rearward side of and coupled to the second carriage for to and fro movement with the second carriage along the second track means.

7. Apparatus as claimed in claim 6 wherein movement of the second and third carriages to and from the rear of the apparatus is arranged to be effected by a second double acting hydraulic ram unit which is secured to the support and the third carriage the ram of the second double acting ram unit being fixedly mounted longitudinally of the support forwardly extending part and the body part (which is slidable lengthwise over the ram being secured to the third carriage.
8. Apparatus as claimed in claim 7 wherein the switching valve mechanism mounted on the third carriage comprises a two-way hydraulic valve switching mechanism coupled to the second hydraulic ram unit and the source of hydraulic power supply so that operation of such switching mechanism can effect operation of the second hydraulic ram unit in causing the second and third carriages to move together to or fro along the second track means.
9. Apparatus as claimed in claim 8 wherein the template follower mounted on the third carriage is coupled to and/or co-operable with a switching arm or shaft of the hydraulic switching valve mechanism so that movement of the template follower will effect operation of the switching mechanism in causing movement of the second carriage and thus movement of the article carried thereby in relation to the cutter means.
10. Apparatus as claimed in claim 9 wherein the template is flat and is arranged for mounting in a horizontal plane on a support arm extending from the first carriage parallel with and above the first track means and across the rear end of the second track means so that the forward or operative edge of the template, which is shaped to determine the required finished profile of the article to be shaped, is capable of traversing and to and fro across the rear end of the second

track means in the path of the template follower.

11. Apparatus as claimed in any one of claims 6 to 10 inclusive, wherein the template follower is in the form of a wheel or roller rotatable about a vertical axis on a stabilizing arm which is pivotally movable in a horizontal plane and has its end part remote from its pivotal connection coupled to or bearing against the rear end of the switching arm or shaft, which is arranged generally parallel with and above the second track means and extends through a body of the switching mechanism.

12. Apparatus as claimed in claim 11 wherein the switching arm or shaft and thus the template follower coupled directly or indirectly thereto, is spring biased towards the template; the spring biasing being arranged to normally cause the valve switching mechanism to actuate the second hydraulic ram unit so as to maintain the template follower in positive contact with the forward operative edge of the template.

13. Apparatus as claimed in any one of claims 6 to 12 inclusive wherein the third carriage with the hydraulic switch mechanism and template follower mounted thereon is movable along the second track means towards and away from the second carriage by a third hydraulic ram unit forming the coupling between the second and third carriages; the third hydraulic ram unit having one end of the ram body secured to the second carriage and having the other end of ram coupled to the third so that the position of the second carriage relative to the third carriage can be adjusted by an operator, according to the size of the article to be profiled and depth of cut required and maintained in the desired position whilst the second and third carriages are moved together in carrying out the profiling

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operation.

14. Profile shaping apparatus arranged and constructed and operable substantially as hereinbefore described with reference to the accompanying drawings.

DATED this 18th day of May, 1970.

SR.

MOTORWAYS (N.Z.) LIMITED

James A. Lawrie &
LAWRIE & COWIE
PATENT ATTORNEYS
343 LITTLE COLLINS STREET
MELBOURNE

15.28470

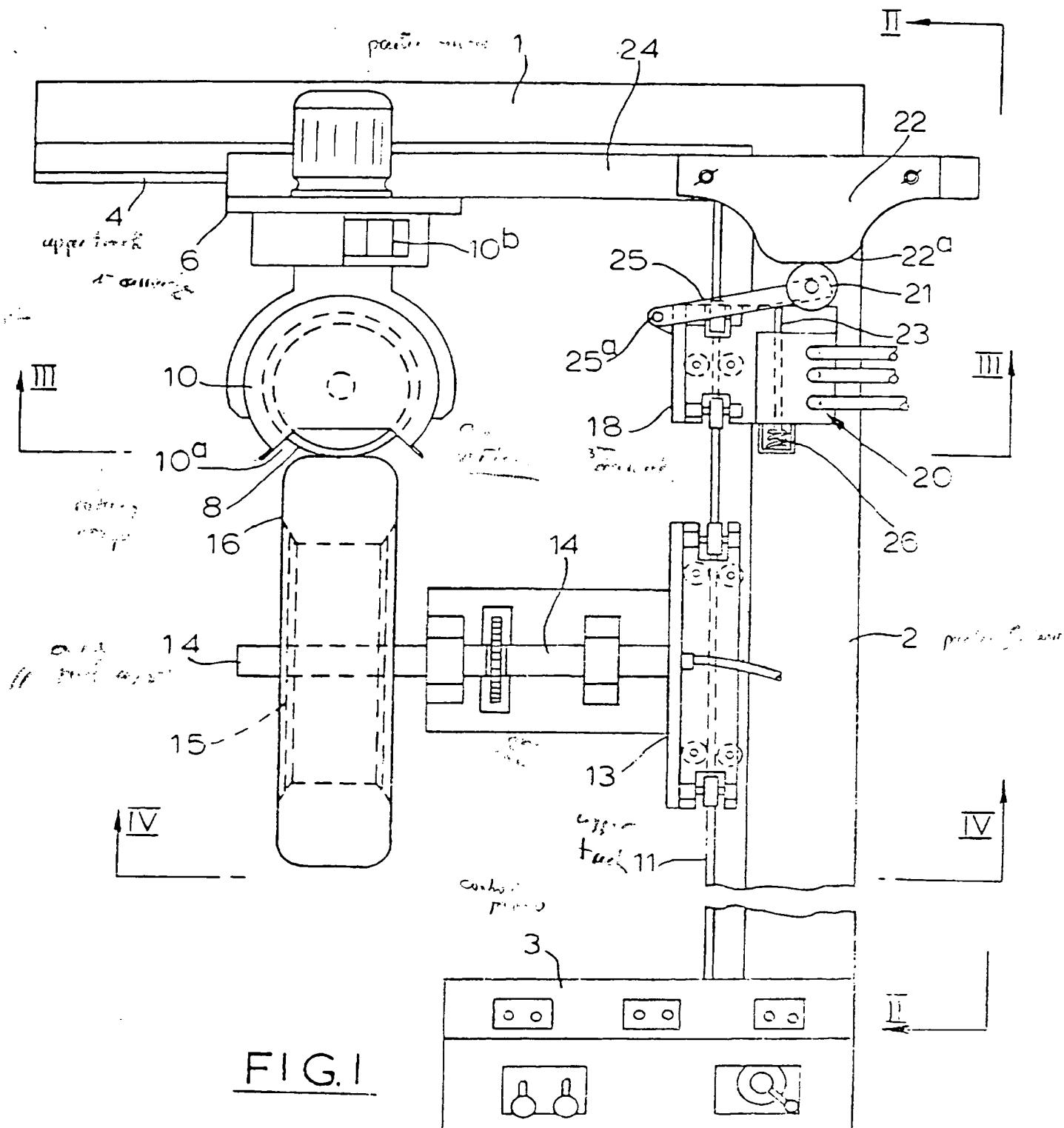


FIG. I

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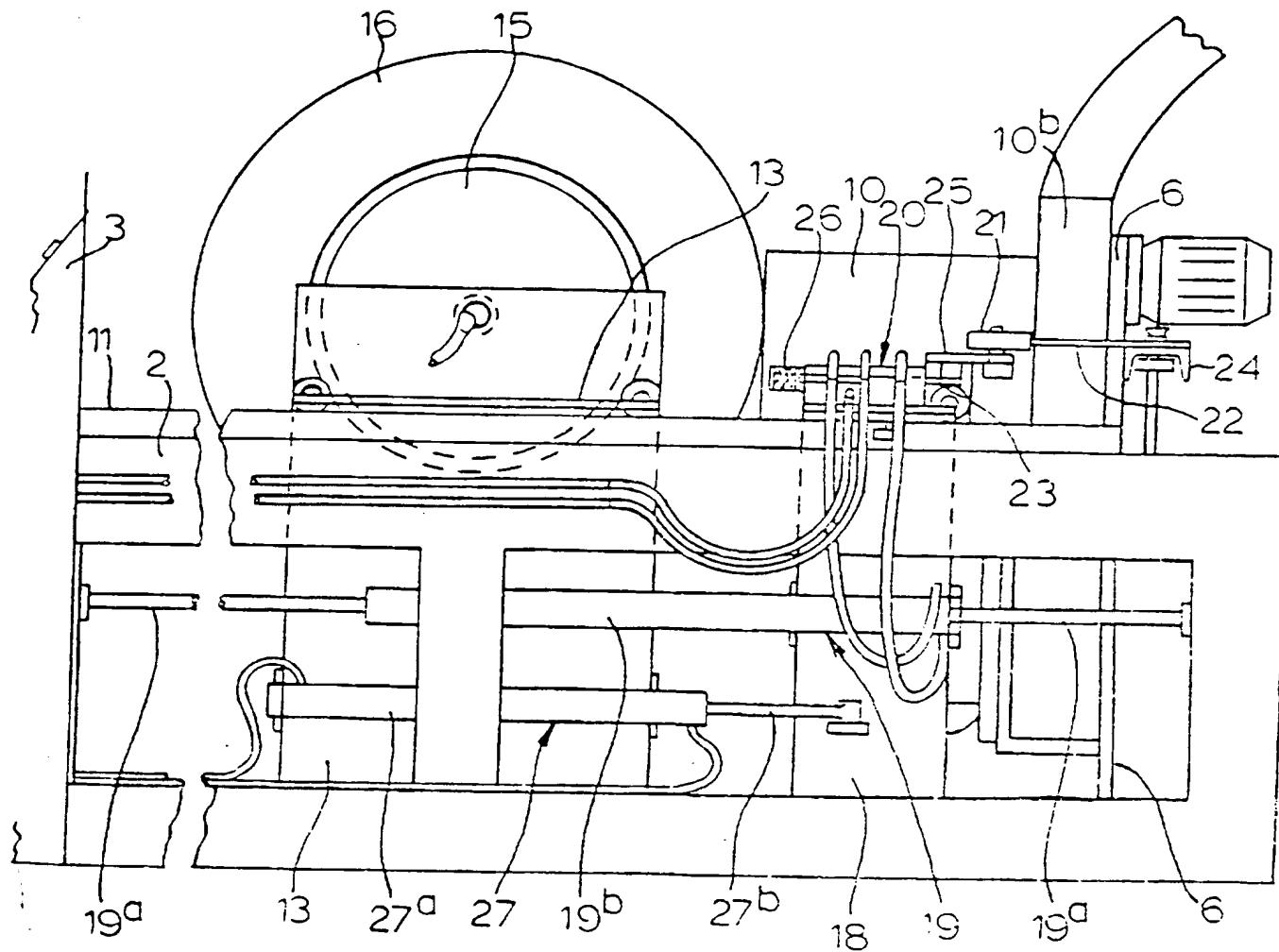


FIG. 2

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